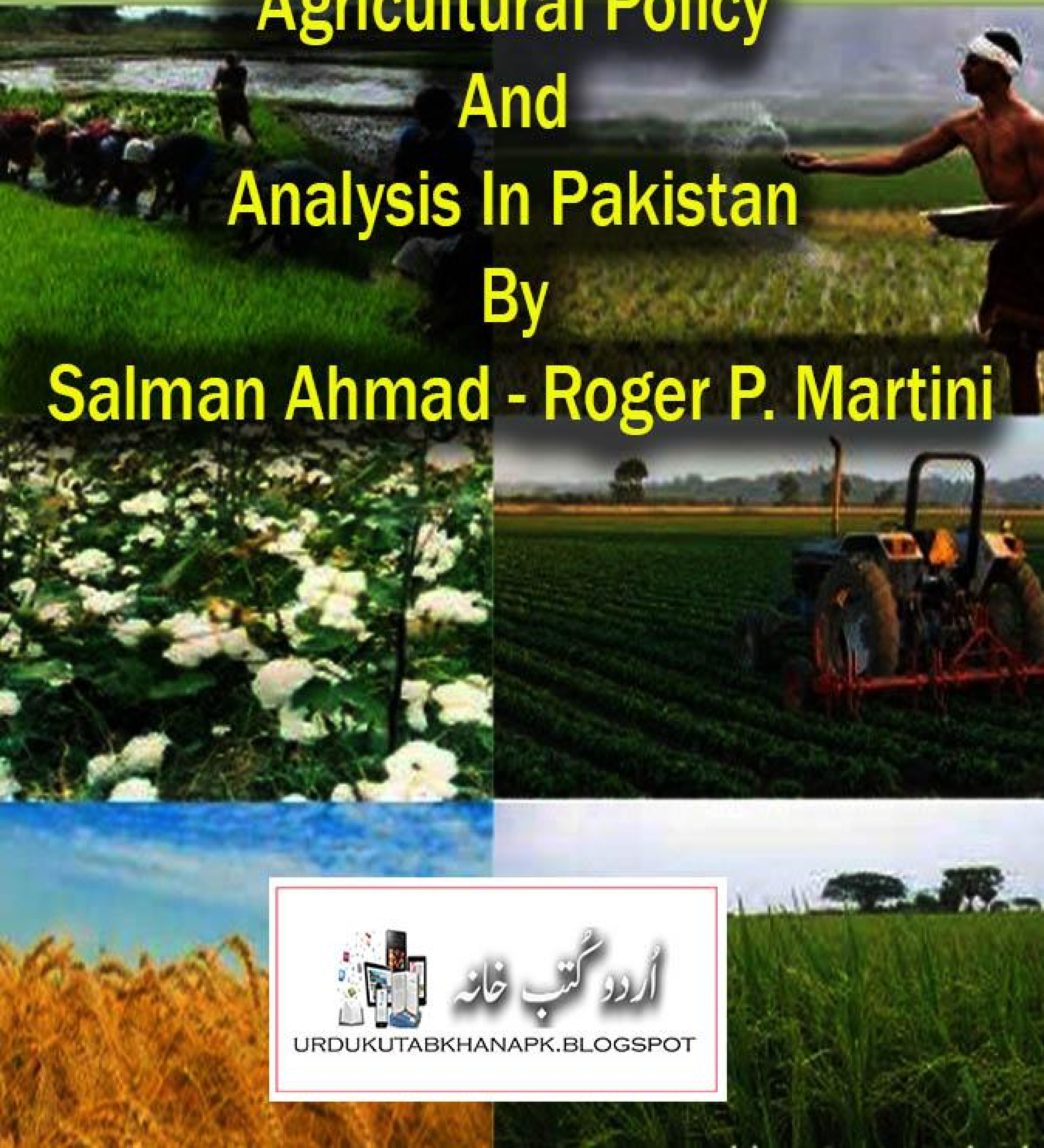
CMER Working Paper Series

Agriculture Policy In Pakistan

Agricultural Policy
And
Analysis In Pakistan

By

Salman Ahmad - Roger P. Martini



اُردو کُتب خانہ
URDUKUTABKHANAPK.BLOGSPOT

CMER Working Paper Series

Working Paper No. 00-27

Agricultural Policy Analysis in Pakistan: Illustrations in the use of the Policy Analysis Matrix

Salman Ahmad

AND

Roger P. Martini

May, 2000

CENTRE FOR MANAGEMENT AND ECONOMIC RESEARCH
Lahore University of Management Sciences
Opp. Sector ‘U’, DHA, Lahore Cantt. 54792, Lahore, Pakistan
Tel.: 92-42-5722670-79, x4222, 4201 Fax: 92-42-5722591
Website: www.lums.edu.pk/cmer

Agricultural Policy Analysis in Pakistan: Illustrations in the use of the Policy Analysis Matrix

May, 2000

By

Salman Ahmad
Roger P. Martini[1]

---

[1] Salman Ahmad was Research Associate in Economics at the Lahore University of Management Sciences, Lahore Pakistan and is Graduate Student in Financial Economics at the University of Delaware, USA. Dr. Marti_ was Visiting Faculty in Economics at the Lahore University of Management Sciences from 1996 to 2000 and is Adjunct Faculty in Agricultural Economics at Washington State University, Pullman Washington, USA. He is also President of Makarios Consulting Corporation of Pullman Washington, USA. He can be contacted at Makarios-l @usa.net

Table of Contents

CONTENTS PAGE#

1. Agricultural Policy Analysis in Pakistan: illustration in the use of the Policy Analysis Matrix .... ,..

Introduction.. 1
Wheat 10
Maize.. 13
Potato 15
Sugar Cane 17
Conclusion 19

Reference............ .... 2 0

Appendix A: Agricultural Budgets in the Punjab 22
Appendix B: Demand Derivation 25
Appendix C: Cost of Producing Basmati Rice in the Punjab, 1999-2000 26
Appendix D: Irrigation Water Rates in Pakistan... 28

Introduction

Emphasis on agricultural price policy is an important and relatively a new phenomenon. Before 1960 Industrialization was thought to be the key to development. But as the Todaro model predicts, both agricultural and industrial sector have to be in balance in order to sustain growth and ultimately development.

Problems soon arose with the industry first strategy. Usually the domestic markets of developing countries lacked depth, so often these new firms had to compete with international firms which were often more efficient. To protect these new firms, government thus resorted to protection which had its own problems. Secondly, developing countries lacked surplus labor, so labour was lured away from the agricultural sector which caused agricultural output to fall and thus disturbing the balance necessary for growth.

Many developing countries such as Pakistan, which relies heavily on agriculture had to pay more attention to the agricultural sector. The policy analysis matrix(P AM) featured in the paper is an analytical technique to help evaluate the overall impact of agricultural price policy and the rationales for policy intervention. The purpose of this paper is first to illustrate the use of the PAM and second to evaluate the degree of protection in the Pakistan's agricultural sector.

Government often impose polices to correct for market failures e.g. provision of the public goods, correction for imperfect markets like rural credit and externalities. Apart from these efficiency corrections, government often steps in for normative issues like income distribution and price stabilization. And in case of agriculture where food is involved, this issue is even more important. Policy analysis technique can give us the cost of these interventions and helps to carry out a cost benefit analysis of a policy provided that governments know the tradeoff between efficiency and non efficiency goals.

However this seldom is the case and this poses difficulty for the policy analysis as consensus on appropriate policy may not be stable based on the cost benefit analysis. Identification of the appropriate tradeoff between efficiency and nonefficiency is further complicated because governments have many nonefficiecny objectives and impose many policies simultaneously. Commodity policies (taxes, subsidies etc), macro price policies (wage rate, interest rate, land rental rate etc) and macro economic policies(fiscal and monetary management) will exert simultaneous impacts on a commodity system. The net impact of government policy and hence the true importance of a particular objective can be assessed only through aggregation of these incentive effects.

The policy evaluation approach used in this working paper is built around a simple analytical framework called the policy analysis matrix(PAM). Like other economic empirical tools this method is also based on assumptions and empirical simplications which may not be realistic but an understanding of its underpinnings is necessary for effective application.

The PAM approach is based on two sets of identities, one defining profitablities and other defining the difference between private and social values. Traditionally the most widely used empirical method to estimate PAM has been the estimates of supply and demand. In principles these are the best estimates but practically sufficient historical data of reliable quality is rarely available. Thus in this paper we will use an alternative approach which is the formulation of budgets for the representative activities --- farming, marketing and processing which compose an agricultural system.

Private valuations of costs and returns are adjusted to take into account the divergences, hence social valuations are determined. These data are almost always available and there is little danger of a deadlock due to lack of data. In most cases(e.g. in this paper) approximations are used to adjust for these divergences. Once these estimates are comprehensive, policy makers can decide to use more expensive approaches. However this approach, though very simple gives a fairly clear picture.

The PAM approach is a system of double entry bookkeeping. Full coverage is given to the policy influences on returns and costs of the agricultural production. The empirical task is to construct a matrix for the study of each selected agricultural system. The impact of polices both commodity and macro(Private valuations) can then be analyzed by the comparison with the absence of policy(Social valuations).

The PAM approach basically addresses three major issues. The effect of policy on competitiveness and farm level profits, the influence of investment policy on economic efficiency and comparative advantage, and the effects of policy on changing technologies.
In this paper with PAM , we will assess the revenues ,costs and profits of selected agricultural systems of Pakistan. The difference between revenues and costs valued at

social prices is a measure of economic efficiency, consequently the impact of policies e.g. new investments then can be gauged by change in social profitabilities and difference between social and private profits(Divergences). The calculation will also reveal the extent of income generated by income transfers, cost benefit analysis of agricultural research, and impact on efficiency due to public investments.

The policy analysis matrix is composed of two accounting identities, one defining profits and the other measures the effects of divergences due to policy distortions and market failures. PAM for an agricultural system can be used to measure both the extent of transfers and the economics efficiency of the system.

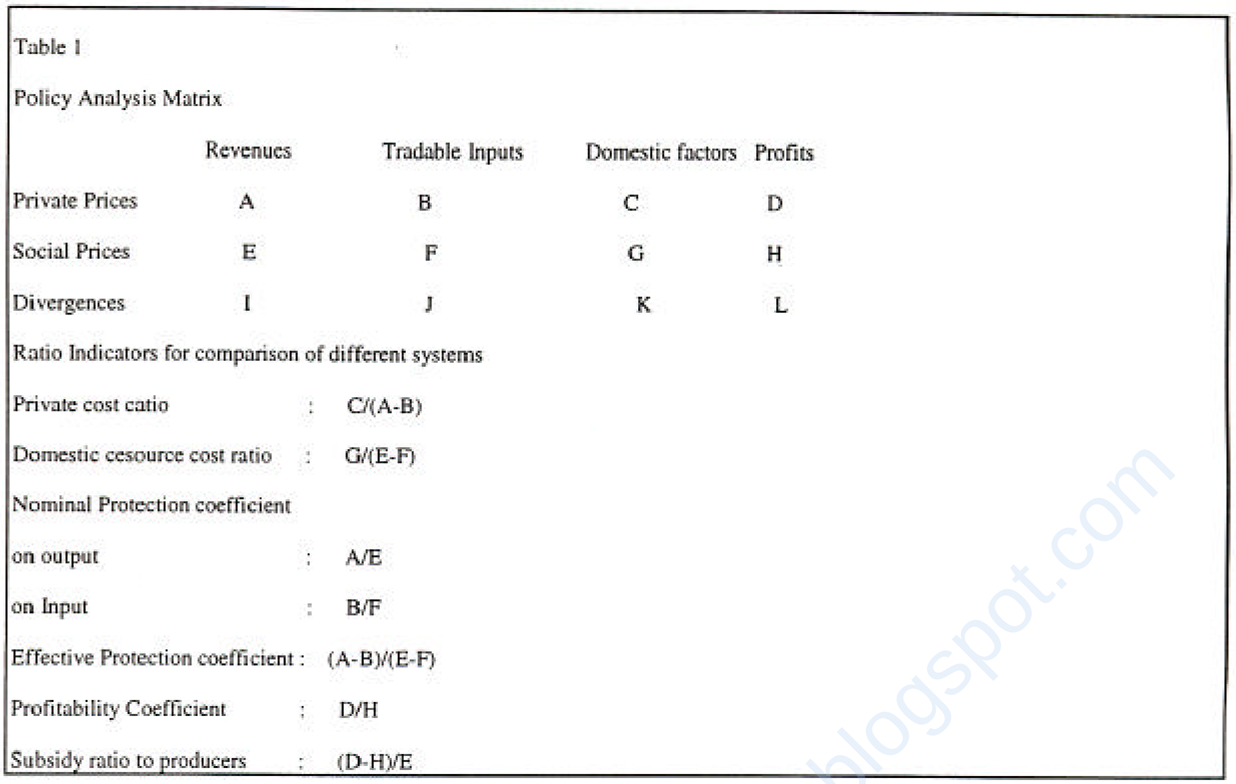


Table 1

Policy Analysis Matrix

	Revenues	Tradable Inputs	Domestic factors	Profits
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Divergences	I	J	K	L

Ratio Indicators for comparison of different systems

Private cost catio : C/(A-B)

Domestic cesource cost ratio : G/(E-F)

Nominal Protection coefficient

on output : A/E

on Input : B/F

Effective Protection coefficient : (A-B)/(E-F)

Profitability Coefficient : D/H

Subsidy ratio to producers : (D-H)/E

Each PAM contains two types of costs, one for tradable inputs which can be traded in the international markets e.g. fertilizers and other for non tradable inputs. For tradable inputs the social price is easy to calculate as it is the CIF(cost, insurance, freight)import price or the FOB price if the good is exported. World prices represent the government's choice to permit consumers and producers to export and import. The social value of the additional output is thus the foreign exchange saved by reducing imports or earned by expanding exports. However the services provided by domestic factors like labor capital and land do not have world prices. The social valuation is found out by the income forgone if the input is used in the best alternative use. As we proceed, we will see how this can be done.

Private Valuation

The data entries in the first row of Table 1 shows the observed revenues and costs reflecting what prices farmers actually pay or receive. The private profitability calculations show the competitiveness of the system given current technologies, output, input costs and policy distortions.

Social Valuation

These valuations are showed in the second row of the matrix and they measure the comparative advantage or efficiency in the system. Efficiency in an economy is achieved when resources are put to their best use. And this what these measures reflect ,as both inputs and outputs are valued at their true scarcity value.

Divergences

The third row in PAM matrix shows the divergences which concerns the differences between social valuations of revenues, costs, and profits. For each entry the difference has to be explained by the presence of distortions or the existence of market failures.

In the following section we will apply the PAM technique to the primary agricultural systems of Pakistan in order to clearly understand application of the technique.

Basmati Rice General Information

Rice is the third largest Corp after wheat and cotton in Pakistan. It occupies about 10% of the total cropped area. Annual rice production averaging around 4.4 million tons, constitutes 17% of the total production of grains. Its share in the value added by major crops is i5 %. Rice exports account for 6 % of foreign exchange earnings in Pakistan and Pakistan is the fourth largest exporter of rice in the world constituting 8 % of global exports in 1998. The 1999-2000 paddy crop was 4.889 million tons.

Specific Price Policies

Like most of the agricultural markets, rice market also suffers from the cobweb phenomenon where price fluctuations are caused by the time lag between making the decision to cultivate the crop and ultimate selling of the crop. To decrease the risk faced by farmers from fluctuating prices, the government has set support prices for various varieties of rice. For the year 1999-2000 the support price was Rs 425-40 kg for super basmati rice and Rs. 175 for Irri Rice.

During 1998-1999 Basmati price ranged from Rs. 330 per 40 kg in the market when the support price was Rs. 330 per 40 kg. Keeping this discrepancy in view the Economic Coordination committee raised the support price for the year 1999-2000 for Basmati. The Government has also set the export F.O.B price of rice at $6.4 per 40 kg for irri whereas the international price is quoted at $6.4 per 40 kg. Similarly for Basmiti the price which was set is $10.75 kg, which is also over the world price.

Inputs

Fertilizer

Fertilizer is one of the most important input for the crop. Pakistan has witnessed frequent price changes (mostly rises) which has attracted a lot of attention as it directly affects the prices of agricultural output. Urea, sold in 50 kg bags, was priced at Rs. 290lbag in the last quarter of 1995 and Rs. 305 in 1999. Currently, the price per 50 kg bag is running at Rs. 350 per 50 kg. The prices have risen inspite of the fact that international prices have decreased because of the reduction in subsidy provided to producers in the from of subsidized gas. The government regulates the pricing of natural gas, the most input to the fertilizer industry. Natural gas is used a fuel and as raw material or feed stick. Previously the government's policy was to supply fuel gas at a rate pegged t high surplus fuel oil, while feed stick at lower rates. However this has been discontinued as subsidies on feedstock gas have been reduced drastically.

The private market price of Urea per kg of Urea inclusive of 10% GST from private supply and private demand analysis is Rs. 7.5/ kg. As the needs of different crops vary, we will make adjustments to the price to take it to account. Rice requirements are mostly phosphate and nitrogen. As urea has 46% nitrogen so the effective price of urea is Rs. 7.5/0.46 = Rs. *16.3/kg.* Similarly the price of super Phosphate urea is Rs. 19.93/Kg (with GST adjustment) and it contains 46 % phosphate. So the effective price of phosphate is Rs. 19.9/0.46 = Rs. 43.3 / kg.

The social price of fertilizer is calculated using the CIF prices the profit margin for exporters. This comes out to be Rs. *7/kg* of nitrogen urea (effective price Rs. *15.2/kg)* and Rs *18.65/kg* (effective price Rs. *40.22/kg)* for super Phosphate Urea. As fertilizer is imported, the international price reflects the true opportunity cost of using fertilizers.

Labor

Labor is another very important input for the rice crop. As there are no minimum wage laws, labor is often exploited in rural areas of Pakistan. However to find the exact distortion between Social and Private Valuation of labor we utilize the data for not only rice but all other crops which are grown in Pakistan. As labor is mobile, the social valuation of labor will be the average of the social value of labor in each crop weighted by the proportion of time spent working on each crop.

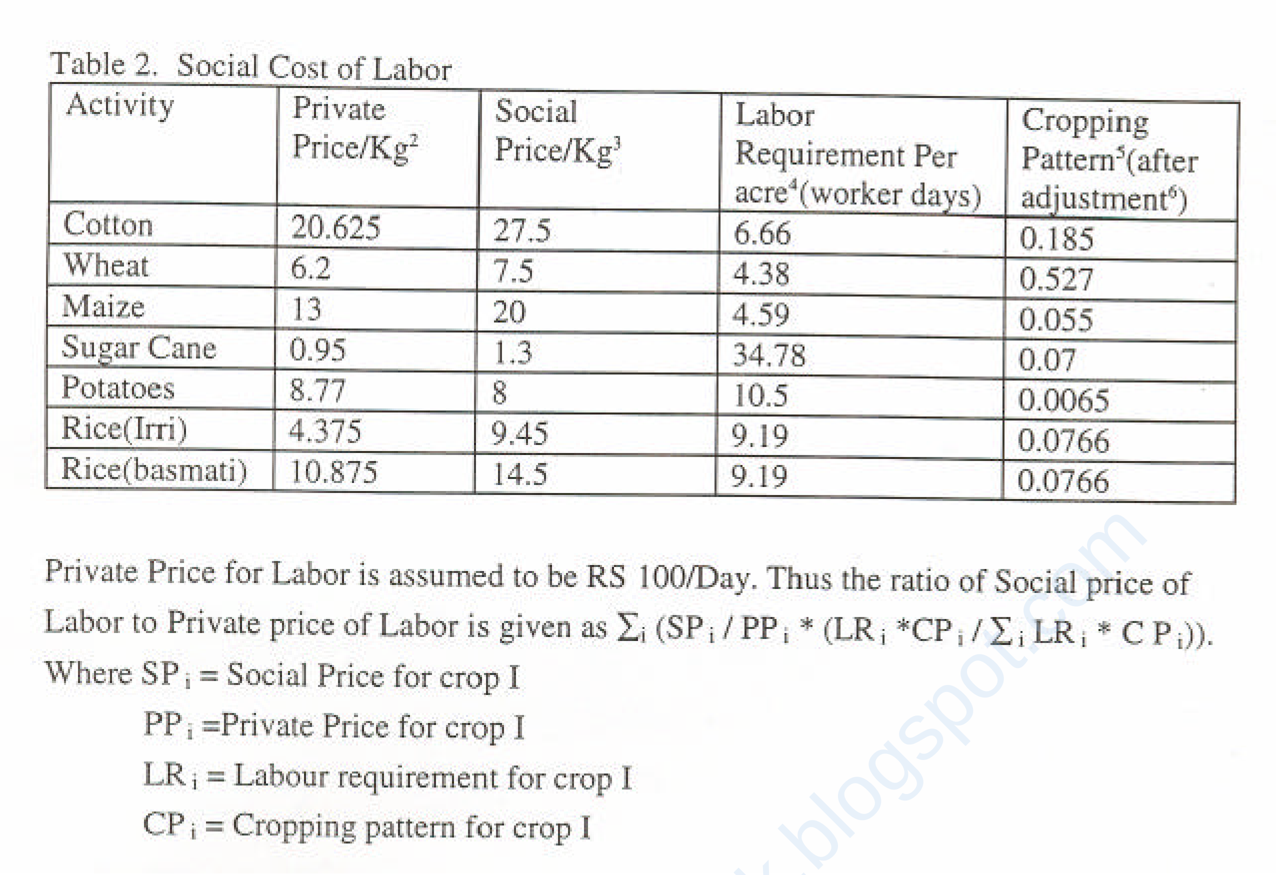


Table 2. Social Cost of Labor

Activity	Private Price/Kg[2]	Social Price/Kg[3]	Labor Requirement Per acre[4](worker days)	Cropping Pattern[5](after adjustment[6])
Cotton	20.625	27.5	6.66	0.185
Wheat	6.2	7.5	4.38	0.527
Maize	13	20	4.59	0.055
Sugar Cane	0.95	1.3	34.78	0.07
Potatoes	8.77	8	10.5	0.0065
Rice(Irri)	4.375	9.45	9.19	0.0766
Rice(basmati)	10.875	14.5	9.19	0.0766

Private Price for Labor is assumed to be RS 100/Day. Thus the ratio of Social price of Labor to Private price of Labor is given as $\sum_i (SP_i / PP_i * (LR_i * CP_i / \sum_i LR_i * C P_i))$.

Where SP_i = Social Price for crop I
PP_i =Private Price for crop I
LR_i = Labour requirement for crop I
CP_i = Cropping pattern for crop I

The calculations indicate that the ratio of social price of labor to private price is 1.352. Thus the social price for Labor is RS 135.2/day , a distortion of 35.2%.This correction will be used in PAM calculations of all the crops mentioned above.

Land Rent

Fixed or Immobile, factors of production are the factors whose private and social opportunity costs are determined within a particular sector of the economy. The value of agricultural land, for example is determined by the land's worth in growing alternate crops. However within an agroclimatic zone complete specialization is not the norm as risks to income from price variability can be reduced by crop rotations. Thus opportunity cost can be evaluated by a weighted average of a basket of crops which can be grown on the land. But as these averages are generally not known so we will interpret the crop profits as rent to land and other fixed factors(e.g. management and ability to bear risk) per hectare of land used.

---

[2] See individual sections for source. 3 See individual Section for source.

[4] Source GAMS Program on Irrigation.

[5] Source Economic Survey 98-99

[6] The area shares have been adjusted to equal one. Originally the area shares for these crops were 86.3%

Seed

The Private cost of seed is RS 640/acre for basmati rice as the seed requirement per acre is 6.4 Kg and the cost of seed is RS 100 / Kg. Similarly the private cost of seed for Irri rice is RS 710/acre as the seed requirement is 7.1 Kg per acre. However as seed is not a tradable item and as it is a project input, so the social price is found by to be the border price substitute, assuming that the industry operates at full capacity.

Tractor

The private price of tractor is taken from appendix 1[7] by taking the sum for dry and wet ploughing which was RS 250 per acre. The Social price is found by scaling the private price upward as follows: Social Price per Unit of rice / Private price per Unit of rice* price.(RS 341.71)

Management

Management is treated in the same way as common labour, as management time will be divided in several crops. However the definition of management doesn’t include the entrepreneur's ability to bear risk and organize the factors of production. Given the private price of labour is RS240/day, the Social price of Labour is found to be Rs324.4/day.

---

[7] Agricultural statistics of Pakistan.

Water

Private Price for water is derived from appendix 2 which is Rs 32.09. Average water charges were obtained for small, medium and large farms and the used to obtain an average rate for all farms. These were the adjusted by a factor of 20 to account for the assumed 95% subsidy granted to water by the Government of Pakistan to arrive at the Social price of water.

Policy Analysis matrix

Table 3 and 4 shows the policy analysis matrix and ratios for basmati rice. The divergences in profits, domestic cost and revenues are negative showing rice is a socially viable project. The society values rice more than the market, so the policy distortions and market failures have reduced the private valuation of rice. The private cost ratio measures the ratio of cost of domestic inputs to the difference between revenues and cost of

tradable inputs. A small PCR implies high profit. For Basmati it is 0.08 , hence growers reap high profits from the commodity. The DRC(0.08) is the social equivalent of PCR. A low DRC implies the high social profitability of rice. NPC/O(0.75) shows the extent of difference between social and private price of output and is equal to private revenues/social revenues. A NPC 0 of 0.75 shows that private price of 75 % of the social price thus policies are reducing the price in the market below the social price. NPC I (1.21) sketches the same picture on the input side and is equal to private cost of tradable inputs to social cost of tradable inputs. A NPC I of 1.21 shows the effect of distortion which has forced the private price of inputs to be 21 % higher than social price. This is manly due to the heavy subsidies which are being given to the fertilizer industry. The EPC(0.74) is an indicator of incentives, is the ratio of value added in private prices to value added in social prices. EPC of 0.74 shows that rice's social value added is more than what is been portrayed in the market due to distortions or market failures. SRP(-0.22) another very important indicator of incentives, shows what subsidy would replace all macro and commodity policies and is equal to the ratio of the differences between revenues from the output and cost of tradable inputs at private and social prices respectively. A negative SRP shows that rice infact is being implicitly taxed rather than subsidized.

Table 3: PAM for Rice Basmati				
Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of domestic Factory*	*Profit*
Private Prices	43260.75	753.5076	3447.1048	39060.14
Social Prices	57681	618.3594	4778.498667	52284.14
Divergences	-14420.3	135.1482	-1331.393867	-13224

Table 4:	
Rice Basmati	
PCR	0.081095
DRC	0.083038
NPCO	0.75
NPCl	1.218559
EPC	0.744922
PC	0.747074
SRP	-0.22926

Wheat

General Information

Wheat is one of the most important crops of Pakistan and exceeds other crops in acreage and production. It accounts for about the 52.7%[8] of total cropped area and 65% of food grain production. It is grown in mild temperatures and a small amount of rainfall, it is sown in October-November and harvested in April-May.

The main Wheat growing region is Punjab, and outside Punjab, Nawabshah in Sindh is the only district where wheat is grown on a large scale. The main production areas in Punjab extend from Sailkot to Rahimyar Khan , an extensive plain with rich alluvium soils and watered by canals and tube wells. The yield per hectare for irrigated land is about twice that for non-irrigated land. The production of wheat has been increasing consistently, mainly due to the increase in acreage and yield/acre.

While trends in the production and yield have shown considerable rise, but Pakistan remained a net importer of wheat. The inability of the country to achieve self sufficiency has been partly due to the lack of resources, inefficiency and sustained increase in the population.

---

[8] Economic Survey 98-99

Specific Output Policies

Before analyzing the effects of the policies for consumers and producers, it would be useful to examine the environment and the reasons which determine the nature of the policy. The government is usually caught in a dilemma when it sets out to device a policy for wheat as it is the most important food crop.

One of the aims of policy is to provide wheat to poor at a subsidized rate however this also means buying wheat from producers at low prices, which reduces the incentive to grow wheat and negatively affects the other aim of policy which is self sufficiency.

The CIF price of wheat is calculated to be RS 620/100KG[9]. This was done by taking the price in terms of UK sterling(Rs 82.35/pound) , which was Pounds 75.2/tonne. The market clearing for wheat is about RS 750/100Kg and the government set it's procurement price at Rs600/100Kg.

Inputs

Private and social prices for each input are identical with those documented under basmati rice. Refer to rice for details.

Policy Analysis Matrix

Table 5 and 6 show the policy analysis matrix and ratios for wheat, which are supported by the results in the budgets given in Appendix A. PAM analysis shows that social profits for wheat are negative signifying that the system cannot sustain without government intervention. This system is wasting scarce resources by producing at social costs higher than social benefits. The choice is clear for efficiency minded analysts which is to enact new policies in order to increase social profitability. The DRC ratio as expected is very high(0.99) implying the low profitability of the sector. Although PCR(0.77) is lower than DRC showing wheat is profitable with government support, but it still very high when compared to other systems signifying low profitability when compared to other systems. SRP(0.36) shows that wheat is implicitly being subsidized as it is positive.

Table 5: PAM for Wheat

Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of Domestic Factory*	*Profit*
Private Prices	6375	1205.7189	4045.384	1123.897
Social Prices	5270	1001.604	5371.429333	-1103.033
Divergences	1105	204.1149	-1326.045333	2226.93

---

[9] financial times Jan 1 2000.

Table 6:	
Wheat	
PCR	0.779319
DRC	0.993735
NPCO	1.209677
NPCl	1.203788
EPC	1.211059
PC	-1.48972
SRP	0.361767

Cotton

Cotton is an important cash crop and main source of foreign exchange earning for Pakistan. It contributes about 5%[10] to the GDP and 55 % to the foreign exchange earning. According to recent estimates, cotton is cultivated on area of about 3.2 million hectares. It is a Kahrif crop. Cotton is primarily grown in the provinces of Punjab and Sindh. Pakistani farmers have been successful in increasing the yield per hectare during the last two decades. In 1983 avg. cotton yield was 360 Kg/hectare which rose to 750Kg/hectare in 1993. The phenomenal growth can be attributed to high quality seeds and greater pesticide use and availability.

Cotton and its related products form a chunk of the exports of Pakistan. Keeping in view the importance of cotton crop with respect to Pakistan's economy, governments in the past have been trying different policies for cotton crop. These polices were not meant only to increase the productivity of cotton crop but also to increase its exports.

Specific Output Polices

The Government has fixed the price of cotton at RS 825/40Kg[11] which is below the market clearing price. However this is done to reduce the downward pressure on price in the harvesting season when supply increases(cob web phenomenon). The export price(FOB) cotton is RS 1100 or $20.4/40Kg which is a true indicator of the social valuation of cotton.

Inputs

Private and social prices for each input are identical with those documented under basmati rice. Refer to rice for details.

---

[10] Economic Survey 98-99

[11] News 9 Oct 99

Policy Analysis Matrix

Table 7 and 8 show the policy analysis matrix and ratios for Cotton, which are supported by the results in the budgets given in Appendix A. The divergence between social and private profitabilities is negative implying that cotton is valued more by the society and policy distortions and market failures have dampened the profitability associated with growing cotton. The low PCR(0.14), DRC(0.17) and NPC O (0.75) show the high profitability both at private and social valuations. However NPC 1(1.21) shows the effects of distortions in the fertilizer market which is very similar to other systems. Negative SRP(-0.18) suggests that cotton is implicitly been taxed unlike wheat. PC(0.76) ratio another indicator of incentives which takes factor transfers into account also shows that payments are being transferred out of the system(it is less than 1).

Table 1: PAM for Cotton

Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of Domestic Factory*	*Profit*
Private Prices	26400	938.244	3756.7119	21705.04
Social Prices	35200	770.4786	6146.356667	28283.16
Divergences	-8800	167.7654	-2389.644767	-6578.121

Table 8:	
Cotton	
PCR	0.147666
DRC	0.175449
NPCO	0.75
NPC1	1.217742
EPC	0.739533
PC	0.767308
SRP	-0.18697

MAIZE

Maize is a Kharif crop in Pakistan. It needs a sufficiently high temperature and a moderate amount of rainfall. It is a food crop but is also used as a fodder. It is not a staple food and has a negative income elasticity. It is a crop which doesn’t need a very good quality soil.

Maize, though grown in many districts, is primarily a crop of the northern part of Pakistan. It is there where rainfall is comparatively heavier and in parts where rainfall is insufficient irrigation facilities are available. NWFP leads other provinces both in area and production. The Punjab comes next. Sindh and Baluchistan have a comparatively small acreage under maize. Sindh and Baluchistan have a comparatively small acreage under maize. The acreage of maize is increasing at slow rate in comparison to that of rice and wheat.

Since maize doesn't figure in the top eighteen imports and exports[12] of Pakistan, it is not an important crop from the point of view of the government policy. It is neither taxed or subsidized. However it is one the major crops of Pakistan from the point of view of production levels. Needless to say that the price of maize is determined by the interaction of the domestic supply and demand functions. However, the government does have a support price for maize to protect farmers' interest. The support price for maize is RS 13/Kg[13] and the social price of maize is the import parity price which is RS 20/Kg.

Inputs

Private and social prices for each input are identical with those documented under basmati rice. Refer to rice for details.

Policy Analysis Matrix

Tables 9 and 10 show the policy analysis matrix and ratios for Maize, which are supported by the results in the budgets given in Appendix A. The divergence between private and social profitability is negative showing that maize is socially valued more. The PCR(O.35) and DRC(0.32) are low but compared to rice and cotton, they are quite high. Thus Maize is profitable unlike wheat, but not as much as rice and cotton are. NPC 0(0.65) also reflects the negative gap between social and private valuations. SRP(-0.24) which is negative, display that maize is been taxed and there is a net transfer out of the system like in the case of rice and cotton.

Table 9: PAM for Maize

Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of Domestic Factory*	*Profit*
Private Prices	13000	484.8969	4423.426	8091.677
Social Prices	20000	369.816	6705.857231	12924.33
Divergences	-7000	115.0809	-2282.431231	-4832.65

---

[12] Economic Survey 98-99

[13] Agricultural ministry

Table 10:	
Maize	
PCR	0.351982
DRC	0.318787
NPCO	0.65
NPCl	1.311184
EPC	0.637544
PC	0.610183
SRP	-0.25906

Potato

Apart from many cash crops Pakistan has been a traditional grower of Potato. Before the introduction of improved variety(mainly from Holland)the quality was poor by World standards. Presently four varieties of Potatoes are produced in Pakistan - Malta, Patrones, Desiaree and Ultimus. Due to the improved quality there has been an increase in the demand for potatoes. Over the years the increase in returns from production has created a strong incentive towards increased potato production from 27000 tons grown on an area of 4 hectares in 1947-48 to 1064000 tons grown on an area of 80,000 hectares in 1995-1996.

Potato is produced in all provinces except Sindh--having the least favourable conditions for production. Due to the large fluctuations in potato production and prices, Pakistan's International trade of Potato(in1cuding seeds) lacks stability. As a matter of fact the export of potato is *"surplus based"*. The price of Potato over the years is showing a cyclical trend(Table 11), this continuous change in the prices is due to the mismanagement. Sometimes farmers produce the crop in excess of the current demand and at times they lag behind. Such fluctuations in quantity produced and prices have effects on the farmer’s income and supply.

Table 11: Potato Prices in the Punjab

Potato prices (A V2. Quality)	**RS/Kg**
1990-1991	5.19
1991-1992	6.32
1992-1993	5.77
1993-1994	5.81
1994-1995	6.32
1995-1996	10.45
1996-1997	12.08
1997-1998	9.31
1998-1999	8.77

Source Economic Survey 1998-1999

Specific Output Policies

Policy makers are confronted with a dilemma like in the case of other food grains as on one hand they want high support prices to encourage production and at the same time they want low prices to the protect the poor section of society.

Incase of the price per Kg of potato there is approximately 9% subsidy provided to the producers. This is a an attempt to avoid the fall in potato prices below the floor set by the existing government. The private price of potato inclusive of subsidy is thus Rs 8.77/kg[14] while the social price (F.O.B) price is RS 8.00/Kg.

Inputs

Private and social prices for each input are identical with those documented under basmati rice. Refer to rice for details.

Policy Analysis matrix

Tables 12 and 13 show the policy analysis matrix for potato, which are supported by the results in the budgets given in Appendix A. The divergence between private and social profitabilities is positive showing that due to distortions and market failures the value of potato in the domestic market is more than the world prices. Low PCR(0.14) and DRC(0.16) imply that potato is profitable, both at social and private valuations. A NPC O(W;09)of more than 1 reflects the positive gap between private and social profitabilities.

---

14 Downfall of agriculture in Sindh by Amir Kabir

The SRP(O.l) shows that potato is being subsidized, which to some extent explains the positive gap.

Table 12: PAM for Potato

Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of domestic Factory*	*Profit*
Private Prices	150484.4	3920.8875	21163.135	125400.4
Social Prices	137272	3323.175	22896.42543	111052.4
Divergences	13212.43	597.7125	-1733.290428	14348.01

Table 13:

Potato	
PCR	0.144396
DRC	0.167525
NPCO	1.9625
NPCl	1.179862
EPC	1.094176
PC	1.1292
SRP	0.104522

Sugar Cane

Sugar cane is one of the most important agricultural outputs of Pakistan and has been termed as a cash crop by the Economic experts. With major capital investments in sugar production and average growth rate of 2.8% in sugarcane yield annually over the last two decades, there is a notion of Pakistan's comparative advantage in sugar cane production which is taken for granted.

All major crops in Pakistan are covered by guaranteed minimum price or support price program in Pakistan which is set in theory by taking many factors into account such as insured farmer income, incentives to the growers and international demand and supply conditions.

Specific **output** polices

As the Government of Pakistan sets the domestic prices of sugar cane which is RS 38/40kg , hence the price received by the growers does not reflect the true social cost of sugar cane production. Since sugar cane is a traded output, its import parity price is taken as its social price. The F.O.B price of sugar cane from USA was US$ 25.5/tonne in 1997

1998 which comes out to be RS 53 per 40KG, given that exchange rate was Rs 52/US$ then. The CIF price of sugar cane comes out to be RS 52 per 40KG.

Inputs

Private and social prices for each input are identical with those documented under basmati rice. Refer to rice for details.

Policy Analysis Matrix

Tables 14 and 15 show the policy analysis matrix and ratios for sugar cane, which are supported by the results in the budgets given in Appendix A. The divergence between profitablities is negative showing that due to distortions and pursuit of non efficiency goals private valuation has decreased. Though the society values sugar cane, resources are not been put in the system. But compared to other systems which had a negative gap, this gap is quite small. So at the aggregate level the effects of the policies have not created a very huge gap between social and private valuations. The PCR(O.69) and DRC(0.73) imply that sugar cane is not a very profitable crop when compared to rice, cotton and maize both at social and private valuations respectively. A negative SRP(0.017) and PC(0.91) of less than I, shows that inspite of the low profitability of sugar it is still been taxed.

Table 14: PAM for Sugar Cane

Policy Analysis Matrix	*Revenues*	*Cost of Tradable input*	*Cost of domestic Factory*	*Profit*
Private Prices	15238	1471.2985	9487.61565	4279.086
Social Prices	20852	1221.065	15085.02163	4545.913
Divergences	-5614	250.2335	-5597.405982	-266.8275

Table 15:

Sugar Cane

PCR	0.696349
DRC	0.73222
NPCO	0.730769
NPCI	1.204931
EPC	0701276
PC	0.919567
SRP	-0.01754

Conclusions

This paper has presented a practitioner's guide to the use of the PAM. This approach can easily be used to evaluate the overall degree affect of all interventions in the agricultural sector. This may be particularly helpful for developing countries like Pakistan. In this paper PAM was used to gain insights into the efficiency of Pakistani agriculture and the effects of policy interventions in the six primary agricultural systems of Pakistan: wheat, rice, cotton, maize, sugarcane and potato. Of these six systems, only wheat was found to be socially inefficient. Cotton and rice, in contrast, were found to be highly profitable both privately and socially. Pakistan appears to enjoy considerable comparative advantage in both of these crops.

References

Gerais A Carlson, David Zilberman, & John Miranowski; "Agricultural and Environmental Resource Economics"; Oxford University press, 1993

M. A. Chaudhry; "The Economics of Past and Prospective 0&1\.1 Investments in The Canal Irrigation Systems In Pakistan's Punjab"; Pakistan Economic Analysis Network Report # 10, 1988.

M. A. Chaudhry; "Rationalization of Irrigation Water Charges in Pakistan: Answers to Some Policy Questions" Pakistan Economic Analysis Network Report # 9, 1988.

Richard Kohls & Joseph Uhl; "Marketing of Agricultural Products"; Macmillan Publishing, 1990

Mahood, F. Walters; "Pakistani Agriculture: A description of Pakistan's Agricultural Economy" Economics Analysis Network, Chemonics International & USAID. 1990.

Eric A. Monke, Scott R. Pearson; 'The Policy Analysis Matrix for Agricultural Development" by. Cornell University Press, Ithaca, NY. 1989.

Ijaz Nabi, Naved Hamid, Shahid Zahid; "The Agrarian Economy of Pakistan, Issues and Policies" by. Oxford University Press, Karachi, 1986.

Krueger, Schiff, and Valdes; "Political Economy of Agriculture Pricing Policy"; World Bank, 1991.

Robert D. Stevens and Cathy L Jabara; "Agricultural development principles: economic theory and empirical evidences"; 1988.

C. Peter Timmer; "Getting Prices Right, The Scope and Limits of Agricultural Price Policies"; Cornell University Press, London, 1991.

C. Peter Timmer, Walter P. Falcon, Scott R. Pearson; "Food Policy Analysis" The World Bank, 1983

UNIDO; "Practical Appraisal of Industrial Projects: Application of Social Cost-Benefit Analysis in Pakistan"; The United Nations, New York, 1980.

UNIDO; "Guide to Practical Project Appraisal: Social Benefit-Cost Analysis in Developing Countries"; The United Nations, New York, 1986.

UNIDO; "Guidelines for Project Evaluation"; The United Nations, New York, 1972.

William A. Ward, Barry J. Deren; 'The Economics of Project Analysis: A practitioner's Guide"; The Economic Development Institute of the World Bank, Washington D.C., 1991.

World Bank; "Pakistan: A Strategy for Sustainable Agricultural Growth" The World Bank Draft Report # 13092, The World Bank, 1994.

Richard o. Zerbe, Jr. and Dwight D. Dively; "Benefit-Cost Analysis In Theory and Practice"; Harper Collins.1994.

Appendix A: Agricultural Budgets in the Punjab

Basmati Rice						
		Output per use of item per acre	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Unit	Kg	3978	10.87	14.5	43260.75	57681
Labor	Worker days	9.19	100	135.2	919	1242.48
Water	Acre feet/acre	0.72	32.09	535.2	23.10	385.34
Seed	Kg/acre	6.4	100	100	640	640
Nitrogen	Kg/acre	24.62	19.93	15.2	490.67	374.22
Phosphate	Kg/acre	6.07	43.3	40.22	262.83	244.13
Tractor	Tractor hours/acre	1.7	250	333.33	425	566.66
Management	Rs/6 months	6	240	324	1440	1944

Main						
Unit		**Output per use of item per acre**	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Labor	Kg	1000	13	20	13000	20000
Water	Worker days	4.59	100	135.2	459	620.568
Seed	Kg/acre	8.85	120	120	1062	1062
Nitrogen	Kg/acre	24.33	19.93	15.2	484.89	369.816
Phosphate	Acre Feet/acre	1.4	18.99	379.8	26.586	531.72
Tractor	Tractor hours/acre	5.67	250	384.61	1417.5	2180.76
Management	Rs/6 months	6	240	324	1440	1944

Wheat						
		Output per use of item per acre	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Unit	Kg	850	7.5	6.2	6375	5270
Labor	Worker days	4.38	100	135.2	438	592.17
Water	Kg/acre	34.8	9.8	9.8	341.04	341.04
Seed	Kg/acre	35.73	19.93	15.2	712.09	543.09
Nitrogen	Kg/acre	11.4	43.3	40.22	493.62	458.50
Phosphate	Acre Feet/acre	1.6	21.55	431	34.48	689.6
Tractor	Tractor hours/acre	7.1	250	206.66	1775	1467.33
Management	Per 6 months/acre	6	240	324	1440	1944

Cotton						
		Output per use of item per acre	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Unit	Kg	1280	20.62	27.5	26400	35200
Labor	Worker days	6.66	100	135.2	66	900.43
Water	Kg	9	14.38	14.38	129.42	129.42
Seed	Kg	30.5	19.93	15.2	607.86	463.6
Nitrogen	Kg	7.63	43.3	40.22	330.37	306.87
Phosphate	Acre ft	1.91	33.73	641.8	64.42	1225.83
Tractor	Tractor hours	5.84	250	333.33	1460	1946.66
Management	Per 6 months/acre	6	240	324	1440	1944

...

Potato						
		Output per use of item per acre	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Unit	Kg	17.15	8.77	8	150484.43	137272
Labor	Worker days	10.5	100	135	1050	1419.6
Water	K	1500	12	12	18000	18000
Seed	Kg	96.25	19.93	15.2	1918.26	1463
Nitrogen	Kg	46.25	43.3	40.22	2002.62	1860.17
Phosphate	Tractor hours	2.5	250	228.05	625	570.12
Tractor	Hectare ft	1.5	32.09	641.8	48.135	962.7
Management	months	6	240	324	1440	1944

Sugar Cane						
		Output per use of item per acre	**Private Price**	**Social Price**	**Cost or rev. at PP**	**Cost Or rev. at SP**
Unit	Kg	16040	0.95	1.3	15238	20852
Labor	Worker days	34.78	100	135.2	3478	4702.25
Water	Kg	3238	0.9	1.3	2914.2	4209.4
Seed	Kg	43.95	19.93	15.2	875.92	668.04
Nitrogen	K	13.75	43.3	40.22	595.37	553.02
Phosphate	Tractor hours	6.2	250	342.10	1550	2121.05
Tractor	Hectare ft	3.285	62.17	641.8	204.22	2108.31
Management	Per months	6	240	324	1440	1944

Appendix B: Demand Derivation

The demand curve is derived using the price elasticity of demand for India. Assuming that demand curve is a cob Douglas function (constant elasticity) having an elasticity of 1.2 and observed market values are 3.5 million tons and RS *7000/ton,* the demand curve comes out to be

log Q= 11.154-1.2Iog P

Similarly the Supply curve is derived using the elasticity of supply for India. Assuming the supply curve is a cob douglas function(constant elasticity) having an elasticity of 1.05 and observed market values are 3.2 million tons and RS *7000/ton* , the supply curve comes out to be

log Q=2.468+ 1.051ogP

APPENDIX (C)

COSTS OF PRODUCING BASMATI RICE IN THE PUNJAB

1999-2000

AVERAGE FARMERS COST OF PROCUCTION ESTIMATES OF BASMATI (PADDY) IN THE PUNJAB 1999-2000 CROP (APPROVED)

S.NO	**Pperations /Inputs**	**Average no of oprs/units / acre**	**cost/unit** Rs.	**cost/acre** Rs.	**Remarks**
	LAND PERPARATION				
	1.1 Dry ploughing	4.00	100.00	400.00	
	1.2 Dry planking	2.00	50.00	100.00	
	1.3 Wet ploughing	3.00	150.00	450.00	
	1.4 Wet planking	1.50	75.00	112.00	
	1.5 Levelling	0.00	100.00	1.00	
2	NURSERY USED (marlas)/Prepared				
	4kg seed + others			400.00	(4kg Seed + Others
3	UPROOTING. TRANSPORTING AND TRANSPLANTING (MAN DAYS)	5.5	90	495	
4	LABOUR FOR BUND MAKING (man day)	-	-	-	
5	WEEDING				
	5.1 Manual	6.00	90.00	540.00	
	5.2 Weedicides				
6	PLANT PROTECTION			435.5	
7	FRAM YARD MANURE	-	-	-	
8	FERTILIZER (bages)				
	8.1 DAP 9	1.00	695.00	695.00	
	8.2 UREA	1.00	360.00	360.00	
	8.3 ZINO SULPHATE	1.00	95.00	95.00	
9	FERTILIZER TRANSPORT & APPLICATION (Rs 12 + 50)			62.00	(Rs. 12 + 50)
10	IRRIGATION				
	10.1 Canal			80.48	
	10.2 Tubwell	7.00	240.00	1680.00	
11	LABOUR FOR IRRIGATION & WATER COURSE CLEANING (mandays)	6.00	90.00	540.00	
12	HARVESTING AND THRESHING				
	12.1 KIND (Kg) @ 5kgs/40 kgs	100	8	800	
	12.3 Cash (Rs)	-	-	-	
13	LAND RENT FOR (for 6 months) @ 4000 PA	6		2000	
14	MARKUP ON INVESTMENT @ 14% Per Annum for 6 Months on item 1 to 14 Excluding water rates	9171		641.97	
15	MANAGEMENT CHARGES (for 6 months) @ 4000/PM for 100 Acers	6	40	240	
16	GROSS COST			9491.48	
17	VALUT OF STRAW	-	-	-	
18	NET COST OF CALTIVATION				
	19.1 Including Land Rent			10133.45	
	19.2 Excluding Land Rent			8133.45	

19	YIELD PER ACER (Kg)	860.00
20	COST OF PROCUCTION (Rs. /40 kgs)	
	21.1 Including Land Rent	471.32
	21.2 Excluding Land Rent	378.30
. 21	MARKETING EXPENSES (40 Kgs)	10.00
22	COST /40 Kgs AT MILL GATE / Mandi Gate	
	23.1 Including Land Rent	481.32
	23.2 Excluding Land Rent	388.30
23	INVESTMENT INCENTIVE @ 25 %	
	24.1 Including Land Rent	120.33
	24.2 Excluding Land Rent	97.08
24	SUPPORT PRICE RECOMMENDED	
	25.1 Including Land Rent	601.65
	25.2 Excluding Land Rent	485.38

APPENDIX (D)

IRRIGATION WATER RATES IN PAKISTAN

CROPS GROSS MARGIN AND EXISTING WATER TATE
(Rupees / Acres)

SMALL FARMS												
	Rice Wheat Zone			Cotton Wheat Zone			Sugar Wheat Zone			Wheat Mixed Zone		
CROPS	**Gross Margin**	**Water Rate**	**Water Rate as Percent of gross margin**	**Gross Margin**	**Water Rate**	**Water Rate as Percent of gross margin**	**Gross Margin**	**Water Rate**	**Water Rate as Percent of gross margin**	**Gross Margin**	**Water Rate**	**Water Rate as Percent of gross margin**
Rice Fine	1651	32.09	1.94	1393	30.65	2.20	1280	31.37	2.45	959	29.11	3.04
Rice Coarse	872	32.09	3.68	721	30.65	4.25	723	31.37	4.34	964	29.11	3.02
Cotton	567	33.73	5.95	1822	33.63	1.85	2023	33.6	1.66	958	33.6	3.51
Maize	1365	18.99	1.39	1364	17.99	1.32	1490	19.2	1.29	914	16.8	1.84
Kharif Fodder	1025	14.76	1.44	1025	14.79	1.44	1306	14.8	1.13	1025	14.8	1.44
Wheat	967	21.55	2.23	508	21.58	4.25	472	21.6	4.58	312	21.6	6.92
Gram	284	15.94	5.61	284	15.98	5.63	284	16	5.63	284	16	5.63
Rabl Fodder	3874	13.59	0.35	2824	13.6	0.48	3714	13.6	0.37	8872	13.6	0.15
Vegetable	6590	11.2	0.17	5933	11.2	0.19	6820	11.2	0.16	5512	11.2	0.20
Oil Seeds	1494	23.42	1.57	1494	23.25	1.56	1494	23.2	1.55	1494	23.2	1.55
Sugarcane	2371	62.17	2.62	1833	59.66	3.25	2746	62.78	2.29	1847	59.51	3.22
Ochards	5250	41.66	0.79	8821	36.23	0.41	2153	41.13	1.91	1761	41.34	2.35

Medium Farms

Rice Fine	1740	32.09	1.84	1467	30.65	2.09	1303	31.37	2.41	1290	29.11	2.26
Rite Coarse	901	32.09	3.56	811	30.65	3.78	692	31.37	4.53	830	29.11	3.51
Cotton	748	33.73	4.51	2026	33.63	1.66	1930	33.6	1.74	773	33.6	4.35
Maize	1205	18.99	1.58	1477	17.99	1.22	1366	19.2	1.41	1044	16.8	1.61
Kharif Fodder	1065	14.76	1.39	1088	14.79	1.36	1346	14.8	1.10	1065	14.8	1.39
Wheat	790	21.55	2.73	655	21.58	3.29	573	21.6	3.77	398	21.6	5.43
Gram	490	15.94	3.25	388	15.98	4.12	388	16	4.12	529	16	3.02
Rabl Fodder	4094	13.59	0.33	4399	13.6	0.31	4040	13.6	0.34	3869	13.6	0.35
Vegetable	6787	11.2	0.17	5572	11.2	0.20	6219	11.2	0.18	5445	11.2	0.21
Oil Seeds	1630	23.42	1.44	1661	23.25	1.40	1661	23.2	1.40	1723	23.2	1.35
Sugarcane	2490	62.17	2.50	2116	59.66	2.82	2910	62.78	2.16	2108	59.51	2.82
Orchards	5639	41.66	0.74	9676	36.23	0.37	2351	41.13	1.75	1799	41.34	2.30

Large Farms

Rice Fine	1314	32.09	2.44	1532	30.65	2.00	1150	31.37	2.73	1250	29.11	2.33
Rice Coarse	523	32.09	6.14	642	30.65	4.77	509	31.37	6.16	1017	29.11	2.86
Cotton	635	33.73	5.31	2110	33.63	1.59	1958	33.6	1.72	1041	33.6	3.23
Maize	993	18.99	1.91	1378	17.99	1.31	1351	19.2	1.42	1081	16.8	1.55
Kharif Fodder	1136	14.76	1.30	1136	14.79	1.30	1417	14.8	1.04	1207	14.8	1.23
Wheat	815	21.55	2.64	644	21.58	3.35	491	21.6	4.40	544	21.6	3.97
Gram	617	15.94	2.58	531	15.98	3.01	531	16	3.01	531	16	3.01
Rabl Fodder	3740	13.59	0.36	4565	13.6	0.30	4310	13.6	0.32	3883	13.6	0.35
Vegetable	6784	11.2	0.17	5954	11.2	0.19	6798	11.2	0.16	5525	11.2	0.20
Oil Seeds	1533	23.42	1.53	1773	23.25	1.31	1773	23.2	1.31	1773	23.2	1.31
Sugarcane	2645	62.17	2.35	2225	59.66	2.68	2993	62.78	2.10	2095	59.51	2.84
Orchards	6278	41.66	0.66	11215	36.23	0.32	3081	41.13	1.33	2436	41.34	1.70

Note: Difference of water rates is due to their being averaged in respect of the canals related to the zones.